"BAMBOO AS A BOON IN PROTECTED CULTIVATION"

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Abstract: The protected cultivation technique is very fastly growing technique to to take more production in different climatic conditions to get rid off lack of food in our country. But this technique is very far from the reach of common man or farmer due to its expensiveness. So condition is same as before. This research work has been performed to give benefits to the normal farmers. These bamboo polyhouse are cheap in cost, provides other occupation in the villlages, spreads greenary, free from subsidy, can be done hilly ares, as well as easy insect management. The success of this technique mainly depends on the bamboo as it requires for the preparation of frame of the structure. There is some more benefits of bamboo. In present time farmers showing interest in bamboo farming which will make more cheap and popular to this technique. Recently goverenment has removed bann from the cutting of bamboo which will help in spread in bamboo farming. We can say that this technique has been developed with the welfare of farmer, consumer as well as nature. This technique will be proved as a boon for farmers.

Keywords: Polyhouse, Bamboo, Cultivation, GI-pipes

Introduction

At present time there is great effect of adverse climatic conditions on agriculture.That becomes subject of great concern for future. Due to adverse climatic condition there is unavailablity of required frequency of light, temperature, humidity, CO_2 and air flow which is favourable for crop production (Singh, 2016). As a result we are not getting proper plant growth and production as expected.

With this there is a great problem of population explosion and reducing land. It is a big curse for future. It will bring huge disaster in future to provide food to this increasing population by decreasing land. So to overcome these huge problems our scientist developed a new technique named as "Protected Cultivation"(Jadhav and Rosentrater, 2017). It was developed to provide protective conditions to the crop against adverse climatic conditions. It was expected that green protected cultivation will be proved as boon for the problem of population explosion and reducing land. But this technology seems to become a problem instead of solution of our problem which will appear as a curse against the boon. In this technology green house or poly house are constructed which costs in lakhs. The main part of money is consume for GI-pipes, for making frame for green house (Bhatnagar, 2014). Due to very expensive manufecturing process this technique is still out of reach for normal farmers. In the construction of greenhouse we requires a strong frame like a house, which is covered by transparent material. Today we are using GI- pipes for making these frames. But now we are talking about the bamboo which can replace the GI-pipes for making frames.

We are working relentlessly to reduce the cost of protective cultivation technology without compromising its functionality and efficiency. We have done this innovation using bamboo which was fruitful as compared to GI-pipes.

Why bamboo was chosen

To make the strong structure of green house we need some poles like GI-pipes (Sarvana et al 2016). We can use bamboo instead of GI-pipes (Yadav et al. 2014). Although we can use other type of wood but where we are talking about the low cost then bamboo will be last option

(Jadhav and Rosentrater, 2017). As bamboo farming can be done very easily and bamboo itself easily available in market at low cost. Bamboo is not a tree. It is a grass. The fastest growing bamboo can grow up to 4 feet in a day. It is extreamly strong. Bamboo has twice the compression strength of concrete and roughly the same strength-to-weight ratio of steel. These bamboo pole are able to withstand strong winds and earthquakes. Our bamboo green house are naturally designed and treated with natural elements to be weather, termite and mold resistant. Our bamboo poles are treated with coltar (Damer / coaltal /Asphalt / Bitumen) to prevent termite and powder post beetle infestation as well as decaying fungi. As a result we will easily complete our goal of cost cutting.

Methodology

It was constructed at IHITC (International Horticulture Innovation and Training Center) Durgapura Jaipur. The bamboo was used to make green house just like as the G-pipes only difference was in the height of the structure (Sarvana and Kumar, 2016). The height of green house was lesser then the green house made with GI-pipes. Before this time these type of green house has been constructed in the world but this is most probably first invention in Rajasthan. We have consider some technical points for making green house with bamboo. These are following:

A. Decrease in the height of green house.
B. During selection of place to make green house with bamboo:

- Surface should be flate.
- There should be proper water content of soil.
- Surface should be high from the nearby surface.
- Easy transportation should be there up to green house.
- Distance between green house and big trees or buildings should be more then 10 metres.
- The pH of irrigation water should be between 5.5 to 7.
- The electroconductivity of water should be between 0.1 to 0.3 ms/cm.
- The pH of soil should be between 5.5-6.5.
- Electroconductivity of soil should be less then 1ms/cm.

C. We have to consider some points about the direction of green house:

- Speed of wind at the place
- Direction of wind
- Frequency of light

According to these all the technical points place of green house was decided. We follow these all conditions for making tooth of saw like warm poly house. The upper open window faced towards east direction.

Scale to make bamboo poly house (Fig 1)

Area- 180 square metre
Length- 16 metre, Width- 11 metre
Height- 4.50 metres (3 metres from both sides)
Depth- 1 metre
Arches- 1 metre
Brasings- 5 metre
Bottom - 2 metre
Parlin pole- 5.5 metre long
Middle pole- 4 metre long
Curtain adapter pole- 4 metre long, Number = 12 , used poles = 150
5 Poles on each side in length, means 10 poles on both sides their width is=20 cm
5 Poles on middle , its width is =15 cm
Parlin pole =10, width is =12 cm
Middlest pole 28 (8 pole used both side, 8 pole used for ventilation , 2 poles are used on upper side of apron)
Bottom pole= 10, width is =12 cm
Poles require to adjust clips and curtain = 4, width is = 10 cm

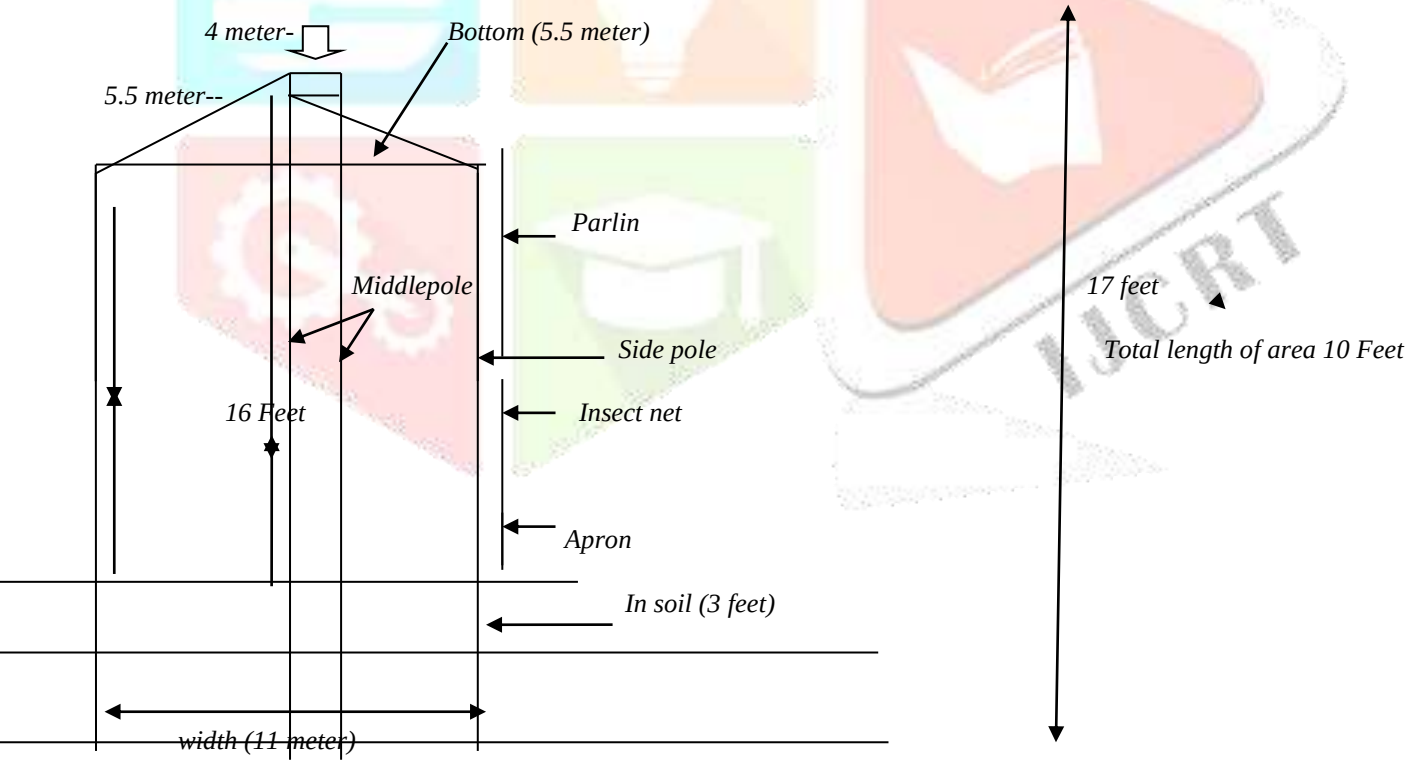

Fig. no 1: Showing the sectional detail of bamboo poly house

Selection of bamboo for making frame:

These all precautions should be taken during selection of bamboo-

- The bamboo which is used for making frame should not be hollow it should be strong enough to make frame.
- The bamboo should not be much thick or thin. It should be medium in size and according to standard of different pole.
- Height of bamboo should be long enough as we can not add in it.

We have prepared a bamboo green house,completly made up of bambooes.The variety is the local thorny variety.We cut at the right stage, when the bamboo will start to have a white powdery substance around the lower portion of the trunk (Sarvana and Kumar, 2016). It was cutted from the bottom of the trunk as this is the hardest part and very good for posts.These poles are usually at least 2 years old.

Different steps to make bamboo poly house

- To start the construction of poly house a place of 200 square metre was selected. It was flatened and cleaned properly (Free from the concreate and other materials).
- We used only 180 square metre of total area to make green house. The length of green house is 16 metre in lentgh and width is 11 metre.
- For making the frame of green house five pits were made on both side lengthwise. The distance between one pit to other was 4 metres, with this five pits were also made on middle , its depth was 1 metre and width was 20 cm. All the pits were dried in sunlight upto 4 days. The distance of middle line and one side lengthwise is 5.5 metres and other side is 5.5 metres (Ray 2017).
- In these pits, the scorched and coltar treated bamboo poles are buried. It covered total 16 metre area lengthwise having 5 poles of 13 feet height each side and five poles of 19 feet height are buried in the middle.
- Before fixing the bamboo poles in the soil, a rough structure has been prepared,on the bamboo poles holes are made using drill machine on fixed position to attach the bamboo poles with each other with the help of nut-bolt.Then for fixing the polysheet on the frame, zig-zag wiring has been made on the frame then fix polysheet.

Framing system

In straight bamboo poles:

In these bamboo first hole has been made three feet far from the land and second was made three feet far from the first one. First hole was used to tie wire which is used for apron. This distance between first hole to second one is used for handle of ventilation curtain which is used for doing up and down to the ventilation sheet during morning and evening.
The last hole has been made before 10 cm from the end point, where cover pole connect the middle pole. Five cm below to this hole another hole has been made to connect this pole to next pole.

In horizontal bamboo poles:

For joining the straight bamboo A to medium pole B the bamboo of 5.50 metre and 5 metre length were joint at 2 % bending downside. Bamboo having length of 5.50 metre were added upper side and bamboo having length of 5 metre added downside on middle pole.(Fig. 2)

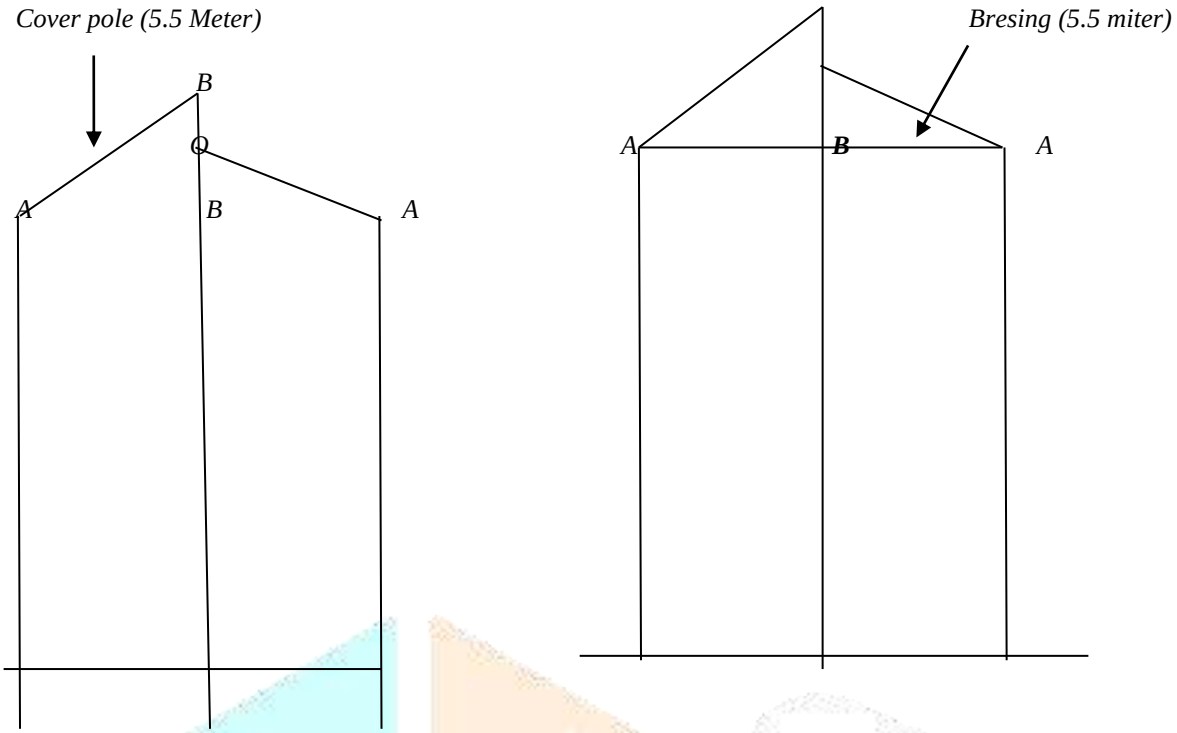

Fig. no 2: Showing the straight arrangement of bambooes.

In medium bamboo poles:

In the medium pole first hole was made 5 cm below from the upper end which will be used to connect the horizontal bamboo used for cover,second hole will be made just below first one which will be used to connect middle bamboo to each other, third hole was made one feet below (which will make strong the space of ventilation).

In all the bambooes of frame used for brasing holes are made which was attached on both side of medium poles .(Fig. 3)

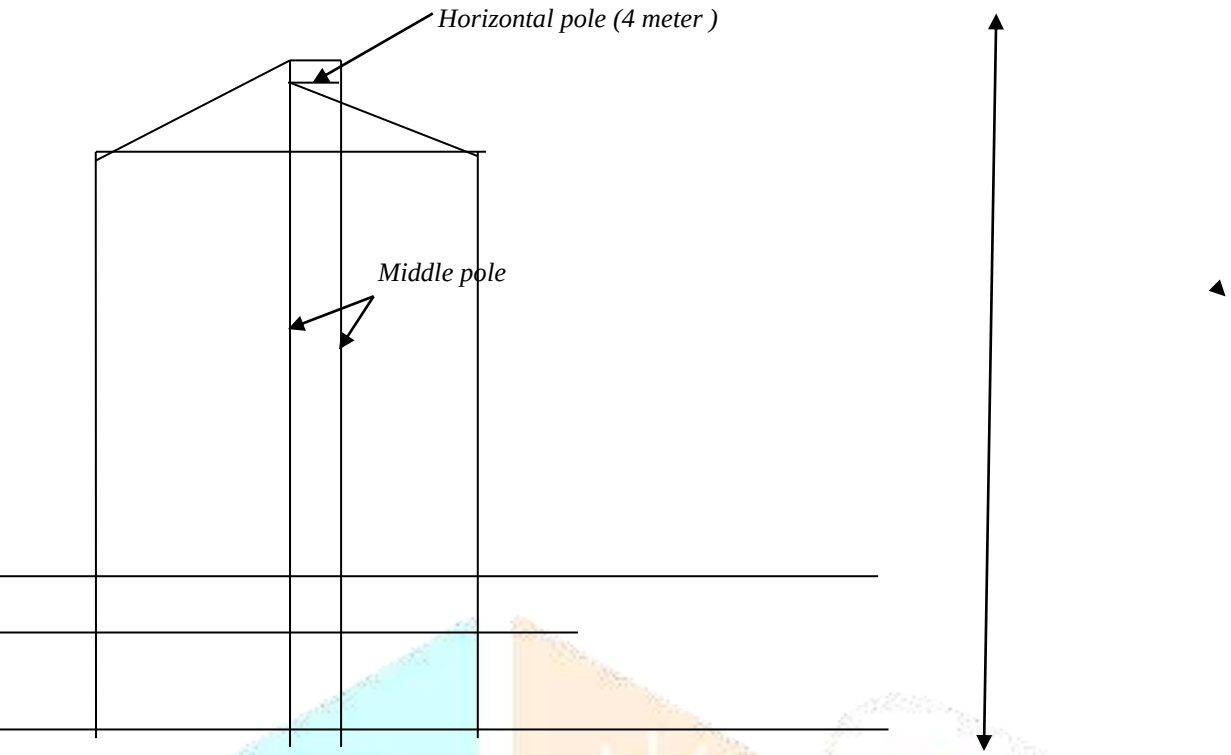

Fig. no 3: Showing the horizontal arrangement of bambooes.

After adding cover pole it was followed by brasing pole. Side poles of 5.5 metre in length will provide strangth to the structure and give support during crop production.

Now this frame is covered with polysheet of 5.5 metre cut lengthwise (200 micron). This type of poly house is just equivalent to modern polyhouse. This poly sheet is covered from all around. But it is open from the parlin side up to three feets. So that the curtain can be open in evening and morning to control the climate of inside the bamboo house.(Fig. 4)

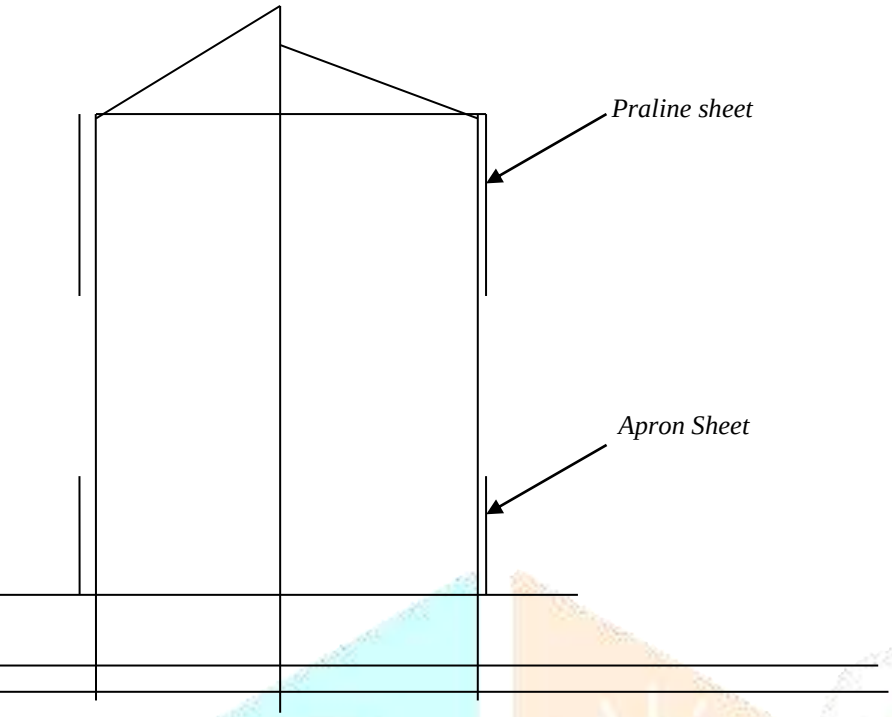

Fig. no.4: Showing the position of parlin and apron in bamboo green house.

Apron was set all around the frame three feet away from the bottom. Apron was bored in land up to 1 feet in depth and covered on the wire between straight bamboos. It was followed by insect net which was below 4 feets from the upper end of straight bambooes.It was again followed by shed net upto 4 feets. Like this the whole green house was set up finally a gate was attached to entering inside.Then we prepared 8 rise beds of 90 cm in height. For irrigation we adapted drop-drop system.

Presently the cucumber crop are going on and all the stages of crop are better then the modern poly house.

Comparison between modern poly house and bamboo poly house:

Initiate bamboo farming:

To start a bamboo poly house, bamboo is first requirement.So we have to extend bamboo farming.

Less expensive:

For making a mordern poly house we have to pay high fees (Jadhav and Rosentrater, 2017). A farmers pays hundreds of rupees per square metre to the companies. But farmer will save this money in bamboo farming by doing all the work itself.

Table: Comparative economic study of bamboo poly house and mordern poly house.

S. No.	**Mordern Poly house** (Acc. to NHM @India)			**Bamboo Poly house**		
	Material	**Amount**	**Price (Rs.)**	**Material**	**Amount**	**Price (Rs.)**
1	**Iron**	**1500 kg**	**1,27,500**	**Bamboo**	**100**	**15000**
2	**Hendle**	**4**	**5000**	**Bamboo pole**	**4**	**500**

3	**Profile**	**300**	**6600**	**Profile**	**No**	
4	**Spring**	**800**	**4800**	**Spring**	**800**	**4800**
5	**Clip**	**50**	**750**	**Clip**	**25**	**250**
6	**Self screw**	**1000**	**1500**	**-------**	**-------**	**-----**
7	**Gate**	**1**	**5000**	**Gate**	**1**	**500**
8	**GI wire**	**15 kg**	**900**	**GI wire**	**15 kg**	**900**
9	**Rope**	**60 mtr**	**540**	**Rope**	**60 mtr**	**540**
10	**Nut bolt**	**200 kg**	**19000**	**Nut bolt**	**10 kg**	**1000**
11	**Apron**	**75m2**	**3000**	**Apron**	**75m2**	**3000**
12	**Insect net**	**75 m2**	**3300**	**Insect net**	**75m2**	**3300**
13	**Ventilation net**	**20 m2**	**600**	**Ventilation net**	**20m2**	**600**
14	**Shed net**	**200m2**	**5400**	**Shed net**	**200m2**	**5400**
15	**Paper sheet**	**650 m2**	**33020**	**Paper sheet**	**650m2**	**33020**
16	**Civil Matterial**	**-------**	**10000/.**			
17	**Installation charges**	**-------**	**30000**	**Installation charges**		**5000**
18	**Other expenses**	**------**	**15000**	**Other expenses**		**5000**
19	**GST**	**-------**	**10000**	**GST**		**nil**
Total expenses			**2,81,910/-**	**Total expenses**		**78810/-**

Employment :

If we starts farming of bamboo to make house it will extends the employment for people as we are using only thick bamboo for making poly house and thin bambooes can be used for making baskets, agarbatti and utensil etc. So this is different type of busniss of farmer which will provide emloyment to the others and income to the farmer.

Increase in greenary and animal fodder:

Presently the changing climatic conditions is the reason of worry there is lot of reasons behind this and reducing greenary and reducing bio diversity is one of them . To solve this problem bamboo farming will prove as boon.

Freedom from subsidy:

The modern poly house technology is very far from the reach of normal farmer due to its expensiveness. To solve this problem government started subsidy on its making (NHM Guidelines 2015-16). But this subsidy is very less for normal farmer.When we look towards the bamboo poly house it is very cheap technology as compared to modern poly house. So without any subsidy a normal farmer can adopt this technology.

Extension in hilly and small zones:

The bamboo polyhouses are very useful technique for hilly areas and climate of hilly areas remains cool which is suitable for bamboo farming. So easy availability of bamboo makes this technique more cheap and durable. Because of its durability it can be made at small farms also.In the moist climate of hilly areas we can make lots of money by making nursary of some expensive plants like orchid, anurium, lilium in bamboo poly house . We can also make the nursary of fruits and vegetables . We can make money by selling them to the buyers of hot areas.

Freedom from pest and diseases management:

In the modern poly house technology the insect and pest management is the major problem which directly affects the crop production. Nematod is the one of them that is one of major cause of failure of the modern poly house.This problem can be resolved by bamboo polyhouse technique like if soil is infected it it can transfer on other place but the modern poly house cannot move as it is stable. But bamboo in bamboo polyhouse has short life so we have to replace them after some time we can solve our problem of soil infection.

Extension of this technique against population exlposion:

Today population explosion is major topic to worry as increase in population resulting in the decreasing land. It is directly related to availability of food. Modern polyhouse claims to solve this problem but results are not according to expectations due to its higher cost. Here due to low cost of manufecturing this technology proved to do better .

What precautions should be followed:

- Natural disasters like high winds,thunder are the main reason of unsucess of bamboo polyhouse.So to make the minimum chances of unsucces or to face the natural problem we have to be careful during construction.These bamboo poles are usually at least 2 years old. To secure the bamboo poles first scorch it then bore it in to the soil.We bury it to a height of one meter. If the soil is sandy then we put a minimum amount of concrete into the pit or we can put small pebbles also.
- All the bambooes are connected by nut bolts with the help of drill machine. All the holes are made on the bambooes before bore it in the soil. Before drilling on the bamboo make the surface rough using saw, as bamboo has very smooth and round surface so proper hole can not be made on it.
- We should use only those bamboo which is in proper required height. Don't use small one by additional in it. as it make week the frame.
- During the construction of bamboo poly house if any bamboo has been broken by mistake replace this with fresh/ new one.
- During connecting the bambooes in the frame the structure should be streched perfectly there should not be looseness in the frame.
- For adding the apron or parlin sheet we should use glue or strong gum never stitch from the thread.
- For climatic conditions of Rajasthan size of poly house is only 200 square meter is suitable as there is possibility of harm due to hot winds.
- During covering with the parlin we should consider about the looseness otherwise this will tore by fast winds. All these precautions should be taken to run bamboo poly house suceessfully.

Reference:

Bhatnagar P.R (2014). Strategies for protected cultivation for small and marginal farmer in India.In agriculture; Towards a new paradigm of sustainability(New Delhi India).pp:158-166.

Jadhav H.T. and Rosentrater K.A(2017). A Review: Economic and environmental analysis of green house crop production with special reference to low cost.ASABE, Annual International meeting, Paper number-1701178,pp:1-7.

Ray I. P. Lala (2017). Poly house construction procedures. www.researchgate.net/publication/321050063.pp:27-29.

Sarvanan Sri M. ADH.,Gandhi Neeraja ADH.,Kumar Hemant B Arch., and Peddy Naveen (2015-16). Mission for integrated development of horticulture.Department of Horticulture, Govt. of Andhra pradesh.Guidelines of protected cultivation.

Singh M.K (2016).Low cost poly house for off season vegetables cultivation.Rashtriya Krishi, Vol-11, pp: 86-86.

Yadav R.K., Kalia P.,Choudhary H., Husain Zakir and Dev Brihma(2014). Low cost polyhouse technologies for higher income and nutritional security.International journal of agriculture and food science technology.Vol -5,pp:191-196.